

| Notice of Allowability | Application No. | Applicant(s) | |
|-------------------------------|------------------|-----------------|--|
| | 10/848,742 | HIRAMOTO ET AL. | |
| | Examiner | Art Unit | |
| | Kevin M. Bernatz | 1773 | |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. This communication is responsive to interview of 5/4/06.
2. The allowed claim(s) is/are 1,2,4,39,41,42,45,48,51,59,65,66,69,71 and 72.
3. Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 - a) All b) Some* c) None of the:
 1. Certified copies of the priority documents have been received.
 2. Certified copies of the priority documents have been received in Application No. _____.
 3. Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

4. A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
5. CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
 - (a) including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
 - 1) hereto or 2) to Paper No./Mail Date _____.
 - (b) including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. Notice of References Cited (PTO-892)
2. Notice of Draftsperson's Patent Drawing Review (PTO-948)
3. Information Disclosure Statements (PTO-1449 or PTO/SB/08),
Paper No./Mail Date _____
4. Examiner's Comment Regarding Requirement for Deposit
of Biological Material
5. Notice of Informal Patent Application (PTO-152)
6. Interview Summary (PTO-413),
Paper No./Mail Date 05102006.
7. Examiner's Amendment/Comment
8. Examiner's Statement of Reasons for Allowance
9. Other _____.

Examiner's Amendment

1. Claim 1 is directed to an allowable product. Pursuant to the procedures set forth in MPEP § 821.04(B), claim 59, directed to the product including the allowable limitations, previously withdrawn from consideration as a result of a restriction requirement, is hereby rejoined and fully examined for patentability under 37 CFR 1.104.

Because all claims previously withdrawn from consideration under 37 CFR 1.142 have been rejoined, the restriction requirement as set forth in the Office action mailed on December 30, 2004 is hereby withdrawn. In view of the withdrawal of the restriction requirement as to the rejoined inventions, applicant(s) are advised that if any claims including all the limitations of an allowable product claim or rejoined process claim are presented in a continuation or divisional application, such claims may be subject to provisional statutory and/or nonstatutory double patenting rejections over the claims of the instant application. Once the restriction requirement is withdrawn, the provisions of 35 U.S.C. 121 are no longer applicable. See *In re Ziegler*, 443 F.2d 1211, 1215, 170 USPQ 129, 131-32 (CCPA 1971). See also MPEP § 804.01.

2. An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

3. Authorization for this examiner's amendment was given in a telephone interview with Douglass Mueller on May 4, 2006.

The application has been amended as follows:

- Claim 1, line 1: after “A”, the following phrase was inserted: “vertical current-type”;
 - Claim 1, line 16: the word “substantially” was deleted;
 - Claim 1, line 16: after “for even m”, the following phrase was inserted: “where each dm equals 1 to 100 nm”.

Reasons for Allowance

4. The present claims are deemed allowable over the reference US 6,767,655 since the reference is commonly assigned and a terminal disclaimer has been filed to obviate the obviousness-type double patenting rejection.

5. The present claims are deemed allowable over the references of record since the references of record fail to disclose or render obvious the unexpected improvement in MR performance and suppressing of the demagnetization field shown by applicants.

While the prior art of record disclose similar structures comprising free layers possessing multiple magnetic layers for use in current-in-plane (CiP) sensors, the prior art of record fail to teach or render obvious the unexpected results observed by applicants for a current-perpendicular-to-the-plane (CPP) type (i.e. applicants’ “vertical current-type”) MR element. Specifically, applicants have provided sufficient evidence that a free magnetic layer including at least one non-magnetic layer and magnetic layers sandwiching the non-magnetic layer, the non-magnetic layer having a thickness of $2.6 \text{ nm} \leq d < 10 \text{ nm}$, the magnetic layers having a thickness of 1 – 100 nm, wherein the

non-magnetic layer is made of a material meeting the claimed limitations and the $Mm \times dm$ values of the magnetic layers meet the claimed limitations.

The present claims are deemed allowable over Parkin (U.S. Patent 5,966,012) since while Parkin discloses a CPP-type MR sensor possessing a free layer having multiple magnetic layers separated by a non-magnetic layer, Parkin fails to disclose the thickness or material of the non-magnetic layer meeting applicants' claimed limitations and also fails to teach that $Mm \times dm$ of the first magnetic layer (i.e. sum of odd magnetic layers) is equal to $Mm \times dm$ of the second magnetic layer (i.e. sum of even magnetic layers). The Examiner notes that Parkin teaches that that *magnitude* of the $Mm \times dm$ is "substantially equal", but that one $Mm \times dm$ is positive and the other is negative so that they add destructively (*col. 7, line 3 bridging col. 9, line 24*). The values must necessarily be non-equal to avoid a case where the overall structure possesses a net magnetic moment of 0 (see *examples*). Finally, the Examiner notes that Parkin fails to recognize the unexpected improvement in MR performance and suppressing of the demagnetization field shown by applicants.

6. Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Conclusion

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kevin M. Bernatz whose telephone number is (571) 272-1505. The examiner can normally be reached on M-F, 9:00 AM - 6:00 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carol Chaney can be reached on (571) 272-1284. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

KMB
May 11, 2006



Kevin M. Bernatz, PhD
Primary Examiner